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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/480,076	01/10/2000	RICKIE C. LAKE	MI40-274	3868

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EXAMINER	
HARAN, JOHN T	
ART UNIT	**PAPER NUMBER**
1733	

DATE MAILED: 04/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/480,076	LAKE, RICKIE C.	
	Examiner	Art Unit	
	John T. Haran	1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9,12,14,23-28 and 51-66* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9, 12, 14, 23-28, and 51-66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the amendment filed on 2/23/04. In light of the amendment to the claims the 35 USC 112 first and second paragraph rejections are withdrawn.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 9, 12, 14, 51-52, 55-56, 60, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (U.S. Patent 4,975,221) in view of Tuttle (U.S. Patent 5558,679) taken with Tsukagoshi et al (U.S. Patent 5,843,251), Kropp et al (U.S. Patent 5,362,421), or Inoue et al (U.S. Patent 5,728,473).

Chen et al discloses a curable epoxy adhesive for use in attaching electrical components together, such as semiconductor die or chips to a substrate, to form a connection wherein the epoxy adhesive contains an electrically conductive filler and an epoxy functional silane adhesion promoter (Column 1, lines 5-11 and Column 3, line 59 to Column 4, line 5). The adhesion promoter is present in the curable adhesive composition less than or equal to about 2% by weight or 1% by weight (Column 4, lines 15-20). Chen et al is silent towards the specifics of using the adhesive to electrically

interconnect electrical components, one of which is a nickel containing metal surface, such as a battery.

One skilled in the art would have readily appreciated that it is well known and conventional to electrically interconnect electronic components via an electrically conductive adhesive interposed between to electronic components by wherein one of the electronic components has a metal surface containing nickel, such as a battery, and then curing the adhesive to create an electrical connection, as shown for example in Tuttle (Column 2, line 63 to Column 3, line 7; Column 3, lines 60-61; Column 6, lines 3-5), and that Chen et al are a general teaching for interconnecting electronic parts. It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect an electrical component with a nickel containing metal surface to another electrical component via an electrically conductive adhesive that is interposed between the components and subsequently cured in the method of Chen et al as suggested in Tuttle.

Chen et al are silent towards the type of silane utilized as the adhesion promotor, however Chen et al do teach any type of epoxy terminated silanes are suitable as the adhesion promotor (Column 4, lines 4-5).

Glycidoxy methoxy silanes are well known and conventional adhesion promotors/coupling agents, as evidenced for example in Tsukagoshi et al, Kropp et al, and Inoue et al. Tsukagoshi et al is directed to a method for electrically connecting circuits by interposing an epoxy adhesive between two circuits (Column 3, lines 30-35). The reference teaches adding a silane coupling agent to the epoxy, such as

glycidoxypropyltrimethoxysilane, in order to strengthen the adhesive interface of the circuits and to improve moisture resistance, (Column 10, line 62 to Column 11, line 12). Kropp et al also teach adding a silane coupling agent to a curable, electrically conductive epoxy adhesive, such as glycidoxypropyltrimethoxysilane, for interconnecting electronic parts (Abstract, Column 6, lines 1-9). Inoue et al also teach adding a silane coupling agent to a curable epoxy adhesive, such as glycidoxypropyltrimethoxysilane, for interconnecting electronic components.

One skilled in the art would have readily appreciated that Chen et al teach using epoxy functional silanes in general as an adhesion promoter and one skilled in the art also would have appreciated, given the general teaching of Chen, using known epoxy functional silanes as the adhesion promoter. Glycidoxy methoxy silanes, such as glycidoxypropyltrimethoxysilane, are well known and conventional epoxy functional silanes used as adhesion promoters, as evidenced by Tsukagoshi et al, Kropp et al, and Inoue et al. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a known epoxy functional silane adhesion promotor, such as glycidoxypropyltrimethoxysilane, in the epoxy adhesive in the method of Chen et al.

Regarding claims 51-52 and 65, one skilled in the art would have readily appreciated that Chen et al is a general teaching for interconnecting electronic parts and that it is well known and conventional in the art to electrically interconnect two electronic components that each has a node that comprises an interface for electrically interconnecting the two components and for the adhesive to contact the interfaces, as shown for example in Tuttle (Column 2, line 63 to Column 3, line 29). It would have

been obvious to one of ordinary skill in the art at the time the invention was made to electrically interconnect two electronic components, each having a node that comprises an interface, wherein the adhesive contacts the nodes in the method of Chen et al

Regarding claims 55-56, it is well known and conventional for epoxy to be made conductive by adding silver to it, as shown for example in Chen et al (Column 3, lines 62-65) and one skilled in the art would have readily appreciated it would have been within the purview of one skilled in the art to determine the necessary amount of adhesion promoter to add to a silver epoxy to ensure adequate adhesion. It would have been obvious to combine the epoxy and silane in the claimed proportions.

4. Claims 23-28, 53-54, 57-59, 61, 64, and 66 are rejected under 35 U.S.C. 103(a) as obvious over Chen et al (U.S. Patent 4,975,221) in view of Tuttle (U.S. Patent 5558,679).

Chen et al discloses a curable epoxy adhesive for use in attaching electrical components together, such as semiconductor die or chips to a substrate, to form a connection wherein the epoxy adhesive contains an electrically conductive filler and an epoxy functional silane adhesion promoter (Column 1, lines 5-11 and Column 3, line 59 to Column 4, line 5). The adhesion promoter is present in the curable adhesive composition less than or equal to about 2% by weight or 1% by weight (Column 4, lines 15-20). Chen et al is silent towards the specifics of using the adhesive to electrically interconnect electrical components, one of which is a nickel containing metal surface, such as a battery.

One skilled in the art would have readily appreciated that it is well known and conventional to electrically interconnect electronic components via an electrically conductive adhesive interposed between to electronic components by wherein one of the electronic components has a metal surface containing nickel, such as a battery, and then curing the adhesive to create an electrical connection, as shown for example in Tuttle (Column 2, line 63 to Column 3, line 7; Column 3, lines 60-61; Column 6, lines 3-5), and that Chen et al are a general teaching for interconnecting electronic parts. It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect an electrical component with a nickel containing metal surface to another electrical component via an electrically conductive adhesive that is interposed between the components and subsequently cured in the method of Chen et al as suggested in Tuttle.

Applicant teaches the contact resistance of an epoxy adhesive without an epoxy terminated silane is too high and unacceptable. Applicant also teaches that the concentration of silane in an epoxy terminated silane lowers the resistance of the adhesive and thereby lowers the contact resistance through a metal surface (Specification, page 6, line 15 to page 7 line 10). While Chen is silent towards the epoxy having an effective metal surface wetting concentration of silane that results in a contact resistance through the metal surface of less than or equal to about .032 ohm-cm2, Chen et al disclose the composition of the epoxy adhesive listing each component in terms of part by weight (See Column 4, lines 15-21). Applicant teaches that the effective concentration of the silane needed to obtain the desired contact resistances is

less than 2% by weight or 1% by weight (Specification, page 5, lines 21-24; page 7, lines 5-10). It is clear from the composition listing in Chen et al that the adhesion promoter (epoxy functional silane) comprises less than 2% by weight or 1% by weight. One skilled in the art would have readily appreciated that Applicant teaches that the determining factor of obtaining the desired contact resistance is the concentration of the silane and the concentration of silane taught in the adhesive of Chen et al is within the effective concentration range taught by Applicant and that therefore it would be expected for the adhesive of Chen et al to have a contact resistance of the desired values (i.e. less than .3, .16, or .032 ohm-cm2).

It would have been obvious to interpose the epoxy adhesive having the disclosed composition between a semiconductor chip and a substrate, both having metal contact sites, and to then cure the adhesive into an electrically conductive bond electrically interconnecting the chip and substrate via the metal contact sites wherein the concentration of silane in the epoxy results in a contact resistance through the metal contact sites of the desired values in the method of Chen et al.

Regarding claims 28 and 64, one skilled in the art would have readily appreciated that it is well known and conventional to electrically interconnect electronic components via an epoxy adhesive wherein one of the electronic components has a surface with metal containing nickel, as shown for example in Tuttle (Column 3, lines 60-61) and that Chen et al is a general teaching for interconnecting electronic parts. It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect

an electrical component with a nickel containing metal surface to another electrical component in the method of Chen et al, as modified above, as suggested in Tuttle.

Regarding claims 53-54 and 66, one skilled in the art would have readily appreciated that Chen et al is a general teaching for interconnecting electronic parts and that it is well known and conventional in the art to electrically interconnect two electronic components that each has a node that comprises an interface for electrically interconnecting the two components and for the adhesive to contact the interfaces, as shown for example in Tuttle (Column 2, line 63 to Column 3, line 29). It would have been obvious to one of ordinary skill in the art at the time the invention was made to electrically interconnect two electronic components, each having a node that comprises an interface, wherein the adhesive contacts the nodes in the method of Chen et al.

Regarding claims 57-59, it is well known and conventional for epoxy to be made conductive by adding silver to it and to add a hardener or curing agent, as shown for example in Chen et al and one skilled in the art would have readily appreciated it would have been within the purview of one skilled in the art to determine the necessary amount of adhesion promoter to add to a silver epoxy to ensure adequate adhesion and the necessary amount of hardener (curing agent) to ensure adequate curing of the epoxy. It would have been obvious to combine the epoxy, hardener, and silane in the claimed proportions.

5. Claims 62-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (U.S. Patent 4,975,221) in view of Tuttle (U.S. Patent 5558,679) as applied

to claim 23 above, and further in view of Tsukagoshi et al (U.S. Patent 5,843,251), Kropp et al (U.S. Patent 5,362,421), or Inoue et al (U.S. Patent 5,728,473).

Chen et al are silent towards the type of silane utilized as the adhesion promotor, however Chen et al do teach any type of epoxy terminated silanes are suitable as the adhesion promotor (Column 4, lines 4-5).

Glycidoxy methoxy silanes are well known and conventional adhesion promotors/coupling agents, as evidenced for example in Tsukagoshi et al, Kropp et al, and Inoue et al. Tsukagoshi et al is directed to a method for electrically connecting circuits by interposing an epoxy adhesive between two circuits (Column 3, lines 30-35). The reference teaches adding a silane coupling agent to the epoxy, such as glycidoxypropyltrimethoxysilane, in order to strengthen the adhesive interface of the circuits and to improve moisture resistance, (Column 10, line 62 to Column 11, line 12). Kropp et al also teach adding a silane coupling agent to a curable, electrically conductive epoxy adhesive, such as glycidoxypropyltrimethoxysilane, for interconnecting electronic parts (Abstract, Column 6, lines 1-9). Inoue et al also teach adding a silane coupling agent to a curable epoxy adhesive, such as glycidoxypropyltrimethoxysilane, for interconnecting electronic components.

One skilled in the art would have readily appreciated that Chen et al teach using epoxy functional silanes in general as an adhesion promoter and one skilled in the art also would have appreciated, given the general teaching of Chen, using known epoxy functional silanes as the adhesion promoter. Glycidoxy methoxy silanes, such as glycidoxypropyltrimethoxysilane, are well known and conventional epoxy functional

silanes used as adhesion promoters, as evidenced by Tsukagoshi et al, Kropp et al, and Inoue et al. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a known epoxy functional silane adhesion promotor, such as glycidoxypropyltrimethoxysilane, in the epoxy adhesive in the method of Chen et al.

Response to Arguments

6. The declaration under 37 CFR 1.132 filed 2/23/04 is insufficient to overcome the rejection of the claims. It appears the declaration is asserting unexpected results with using silane additives to a conductive epoxy when bonding to a nickel surface or to a battery because it increased the wetting characteristics and thereby improved conductivity (see paragraphs 6 and 7). However there is no proof that an electrically conductive epoxy adhesive with silane additives has better electrical conductivity with a nickel surface or battery than the electrically conductive epoxy adhesives that were previously used to bond to a nickel surface or battery as disclosed in Tuttle '679. A comparison of the electrical conductivity of the claimed conductive epoxy adhesive with silane additives bonded to a nickel surface or a battery with the conductive epoxy adhesive of the prior art (Tuttle '679) bonded to a nickel surface or a battery which demonstrates the unexpectedly higher conductivity with the epoxy terminated silane would be sufficient to overcome the 103(a) rejections of the claims. Absent, such a showing of unexpected results, one skilled in the art would have been motivated to use

known conductive epoxy resins with known adhesion promoters in the claimed embodiments.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John T. Haran** whose telephone number is **(571) 272-1217**. The examiner can normally be reached on M-Th (8 - 5) and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John T. Haran

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